Basement Finishing Considerations

Finishing a basement to make additional living space in a house is a popular construction project for many homeowners. Homeowners with some construction skills can often do the work themselves, or if a contractor or other person is hired, the costs are usually reasonable. The following information concerns building and zoning regulations which must be considered before you start your project.

1. A building permit is required for finishing a basement. Electrical, mechanical and plumbing permits are also required, if any of these systems of the house are altered. The Zoning Department has regulations in addition to those of Code Administration; please contact Zoning at 703 385-7820 to learn their requirements/regulations.

2. To obtain permits, complete an application and submit plans/drawings which show the work to be done. The Code Administration Office does not draw plans. It is the responsibility of the applicant to submit 4 sets of plans which are complete and show in detail, the scope of the work to be done.
   What details are required on the plans?
   - Plans must be drawn to scale (minimum scale; ¼"=1'-0"), showing the width, length and other dimensions of the room(s) of the basement. The height from the floor to the underside of the floor joists above must also be shown. Also, indicate the size and location of any beams which project below the floor joists.
   - Plans must show existing construction such as stairs and partitions, and the new proposed construction. Please show a typical wall section, indicating the studs to be used, the size and location of openings in walls, insulation in exterior walls and the interior finish (gypsum board, paneling, etc.).
   - The use of each space in the basement must be shown on the plans.
   - Doors and windows must be shown and their sizes indicated.
   - Equipment such as a furnace, sump pump or water heater must be shown and designated as either fuel burning or electrically operated. For fuel burning equipment, please indicate the BTU input requirements (shown on a label on the equipment).
   - Existing electrical lighting, switches and receptacles, service panel, smoke detector, circuit for electric dryer or hot water heater, and other existing electrical equipment must be designated on the plans.
   - New proposed switches, lighting, smoke detector(s), receptacles, GFCI protected receptacles, and any other electrical equipment must be indicated. Also indicate any new circuits, including the size of the circuit breaker (or fuse), and the size and type of the wiring.
   - Details of all new plumbing fixtures must be indicated on the plans. If the plumbing drain pipe, water pipes, and vent pipes were “roughed-in” at the time the

house was constructed, please indicate the location of these. If you are installing new DWV piping, please indicate the size, material and location of the new piping. Also, indicate where any new drain and vent piping will connect to the existing system.

- Indicate any alterations to the existing heating and ventilation system, such as the addition of new ducts and registers. Details of any new heating or air-conditioning system must be shown. Note; an exhaust fan for a new bathroom must discharge to the exterior of the house.

Definitions:

Ceiling Height. Ceiling height shall be the clear vertical distance measured from the finished floor to the finished ceiling. Habitable rooms, except kitchens, shall have a ceiling height of not less than 7 feet. Beams spaced not less than 4 feet on center may project not more than 6 inches below the minimum ceiling height (bottom of beam may be as low as 6 feet 6 inches from the floor).
Ceiling height in basements without habitable spaces may not be less than 6 feet 8 inches clear except under beams, girders, ducts or other obstructions where the clear height shall be 6 feet 4 inches.

Habitable Room. Habitable room shall mean any room meeting the requirements of this code for sleeping, living, cooking or dining purposes, **excluding** such enclosed places as closets, pantries, bath or toilet rooms, hallways, laundries, storage spaces, utility rooms and similar spaces.

Kitchen. Kitchen shall mean an area used, or designated to be used, for the preparation of food.

3. Bedrooms:
   - ♦ Emergency egress: An approved window or door opening directly to the outside of the house, is required for every bedroom. A grade level window must have a minimum clear opening of 5.0 square feet. The minimum clear width of the opening must be 20 inches, and the minimum clear height of the opening must be 24 inches. Please note that if you multiply 20 x 24, the area is 3.33 square feet, and does not meet the minimum area requirement. The window sill must not be higher than 44 inches above the floor. Please see the attached **emergency escape and rescue requirements** handout.
   - ♦ A new bedroom must have a smoke detector both inside and outside the bedroom. The smoke detector outside the bedroom must be in the immediate vicinity of the bedroom door. Where there is no finished ceiling already in place, the smoke detectors must be "hard wired" (connected to the house's electrical wiring), be connected to each other, and other smoke detectors in the house if possible. If one smoke detector is activated, all the others will also be activated, and everyone will be alerted to the trouble. Please see the attached **smoke alarms in single family dwellings** handout.

- ♦ Light and Ventilation. All habitable rooms shall be provided with aggregate glazing area of not less than 8 percent of the floor area of such rooms. One-half of the required area of glazing shall be openable.
  Exceptions.
  A. The glazed areas need not be openable where the opening is not required by International Residential Code/2006 Section R303 and an approved mechanical ventilation system is provided capable of producing 0.35 air change per hour in the room or a whole-house mechanical ventilation system is installed capable of supplying outdoor ventilation air of 15 cubic feet per minute per occupant computed on the basis of two occupants for the first bedroom and one occupant for each additional bedroom.
  B. The glazed areas may be omitted in rooms where the opening is not required by International Residential Code/2006 Section R303 and an approved mechanical ventilation system is provided capable of producing 0.35 air change per hour in the room or a whole-house mechanical ventilation system is installed capable of supplying outdoor ventilation air of 15 cfm per occupant computed on the basis of two occupants for the first bedroom and one occupant for each additional bedroom, and artificial light is provided capable of producing an average illumination of 6 foot-candles over the area of the room at a height of 30 inches above the floor level.
- Furnaces and Water Heaters. Fuel burning furnaces and fuel burning water heaters located in a bedroom shall be installed in a sealed enclosure such that combustion air will not be taken from the living space. IRC Sections M1701.4 & M2005.2.

- Door from a Garage. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. IRC Section R309.1.

4. Furnace rooms:
   - ♦ A furnace or boiler which is fuel fired (gas or heating oil) and a fuel fired water heater, must have sufficient air for complete and proper combustion. An insufficient air supply can result in carbon monoxide being produced, and even small concentrations of carbon monoxide can be fatal. If your basement is completely open, and you want to enclose the furnace/boiler/water heater in a small area, louvers or other openings must be incorporated in partitions or doors, to allow fresh air to reach the equipment.

4. Firestopping:
   - ♦ Concealed spaces formed between vertical and horizontal spaces must be firestopped with approved materials. This is to prevent the rapid spread of flames and smoke in the event of a fire, and allow extra time for the occupants to be alerted and take appropriate action. See the attached sketch for typical firestopping locations.

5. Joists may have bored holes for wiring, plumbing or gas piping, or other equipment. See the attached sketch for limitations for holes in joists.

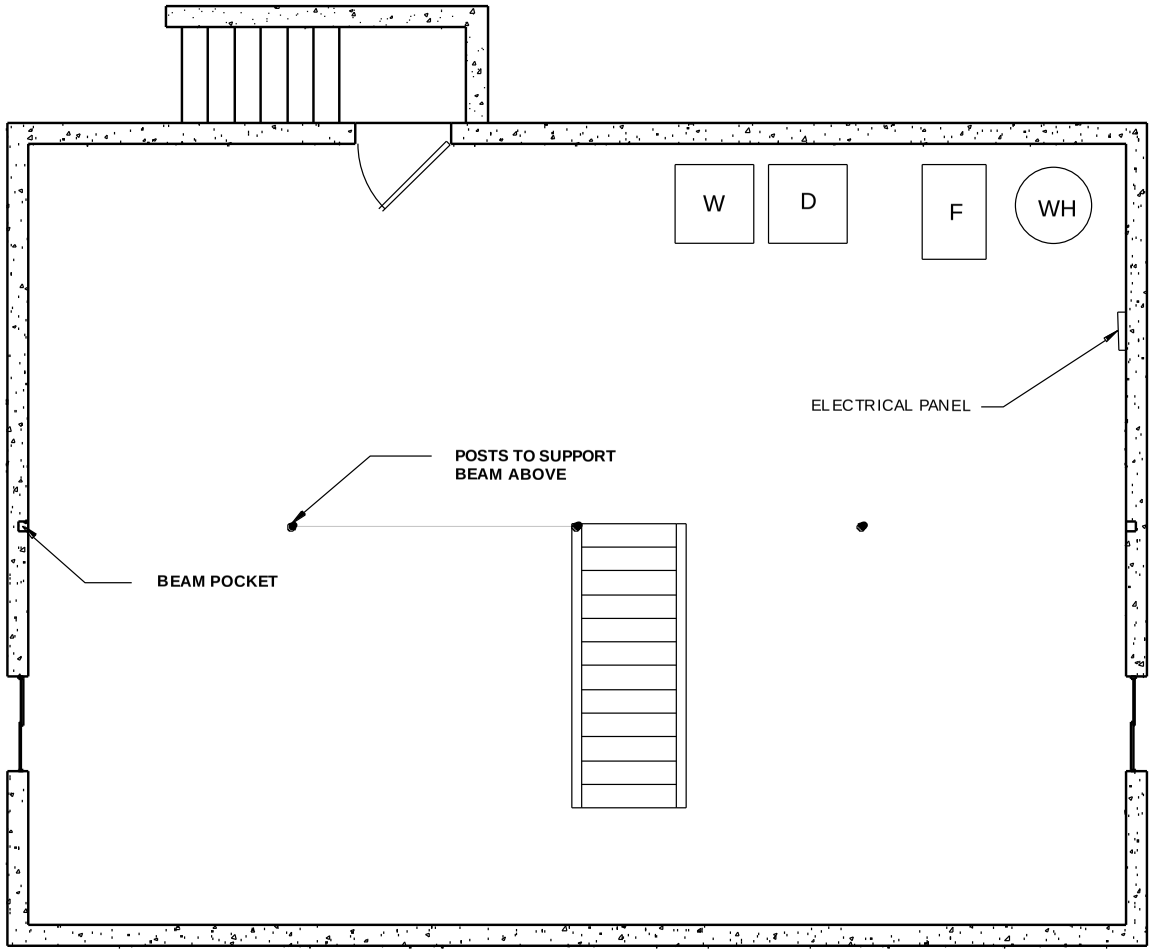
6. These considerations are not meant to be a design document. There are other considerations, such as bathrooms, insulation, heating and cooling, use of rooms, etc., that only the people who will be using the space must decide upon. All these details must be shown on your plans/drawings.

The attached drawings show a “typical” basement remodeling project. The unfinished basement contains a washer/dryer, a gas furnace and a gas water heater. The two existing windows in the basement are 24" high by 36" wide sliding type windows, with the window sill 5' above the floor. The existing height from the concrete floor to the bottom of the floor joists is 8', the washing machine drains into an existing sanitary sewer stack, there are no partitions except those beside the existing stairway, and the house electrical panel is located as shown.

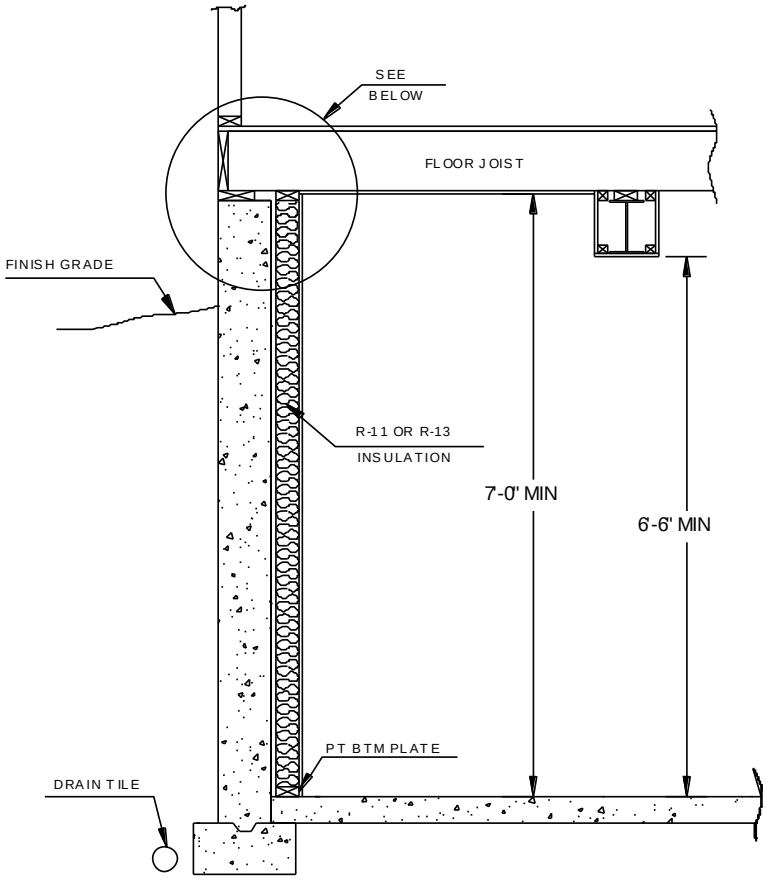
The owner has decided to create two new bedrooms, a bathroom, closets, and install a wet bar as shown on the “typical” basement plan. For this remodeling project she will be required to obtain a building, electrical, mechanical and plumbing permit.
For this project, attention must be paid to the following items:

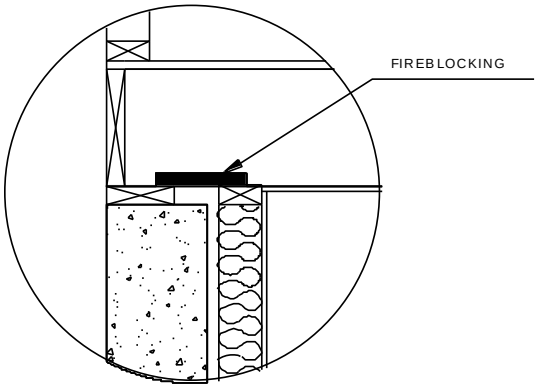
- An emergency escape and rescue window must be installed in the larger bedroom. In this example the basement wall is underground, which means that a window well must be constructed. In an emergency, the occupants must be able to exit out the window, or fire fighters must be able to enter through the window in order to rescue an occupant inside.
- Smoke detectors are installed inside and outside the bedrooms, and the smoke detectors are “hard wired” (connected to the house electrical system), and interconnect together.
- The dryer, furnace and water heater are gas fired equipment, and will require fresh air for combustion. The new partition to enclose these items will have louvered doors to allow fresh air to the equipment.
- The closet created under the stairs must have ½" gypsum board installed on the inside of the closet, and on the underside of the stairs. AFCI is required for all new bedroom receptacles. A dedicated 20A circuit is required for a new bathroom.
- Access to the electrical panel must be maintained. A 36" space in front of the panel, and a 30" wide space for the panel, is required. Note that with the louvered doors of the furnace room closed, this space is maintained.
- A new bathroom and wet bar will be created. The bathroom exhaust fan shown must vent to the outside of the house. Details of the plumbing water piping, waste piping and vent piping, must be provided with the plumbing application. The bathtub/shower control valve must be the anti-scald type **(meets ASSE 1016 standard).**
- Light fixtures are not shown. A switch is provided at the entrance to each room, and this switch must operate either an overhead light fixture or a wall receptacle, so that people do not have to enter a dark room. Existing electrical equipment for the washer/dryer, furnace, etc., is not shown. A switch is required at the top and bottom of the stairs to operate a light witch will illuminate the stairs.
- Details of wood framed partition walls with firestopping, insulation, and other construction details must be on the submitted plans.
- The HVAC ducts are not shown. Typically a main supply duct is located under the floor joists, and extends most of the length of the house. New supply ducts may be attached to this trunk line, to supply individual rooms.

The City of Fairfax, Office of Code Administration, has a “walk-in” plan review service every day from 1:00 to 4:00PM at our office in City Hall, available to permit applicants who have smaller projects such as decks, residential additions, remodeling, garages, small tenant build-outs, or other similar size jobs. There is no additional fee, over and above the permit fee, for this service. By examining your permit application and plans with you, questions can be answered right away, and usually your permit can be issued the same day. To take advantage of this service, you may want to schedule an appointment at least one day ahead of time by calling the Code Administration Department at 703 385-7830, or you can come to our office the same day and you will be given the next available time period, if there is an opening.



UNFINISHED BASEMENT

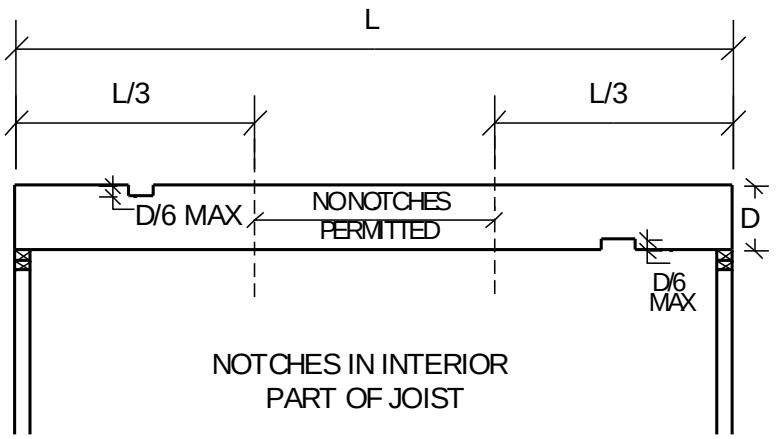




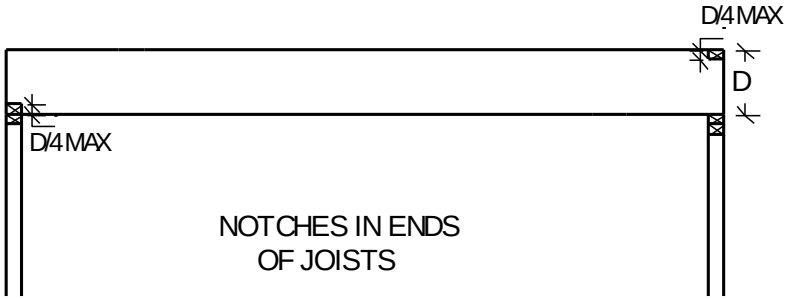
FIREBLOCKING MATERIALS:

FIREBLOCKING SHALL CONSIST OF 2-INCH NOMINAL LUMBER, TWO THICKNESSES OF I-INCH NOMINAL LUMBER, ONE THICKNESS OF 23/32" WOOD STRUCTURAL PANELS WITH JOINTS BACKED WITH THE SAME MATERIAL, ONE THINKNESS OF 3/4" PARTICLEBOARD, 1/2" GYPSUM BOARD, OR 1/4" CEMENT BASED MILL BOARD. BATTS OR BLANKETS OF MINERAL WOOL OR GLASS FIBER OR OTHER APPROVED MATERIALS INSTALLED IN SUCH A MANNER AS TO BE SECURELY RETAINED IN PLACE SHALL BE AN ACCEPTABLE FIRE BLOCK.

TYPICAL ELEVATION



NOTCHES IN INTERIOR
PART OF JOIST



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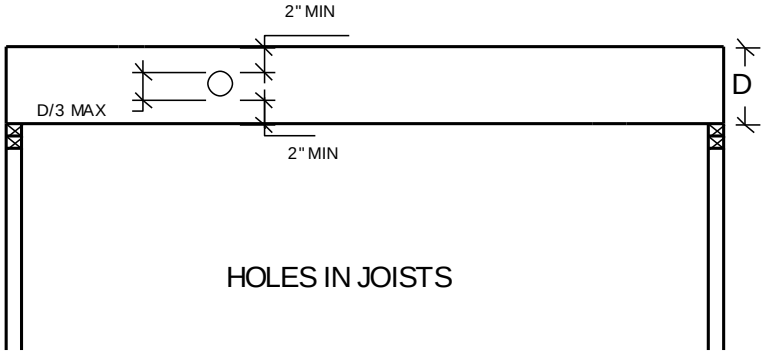
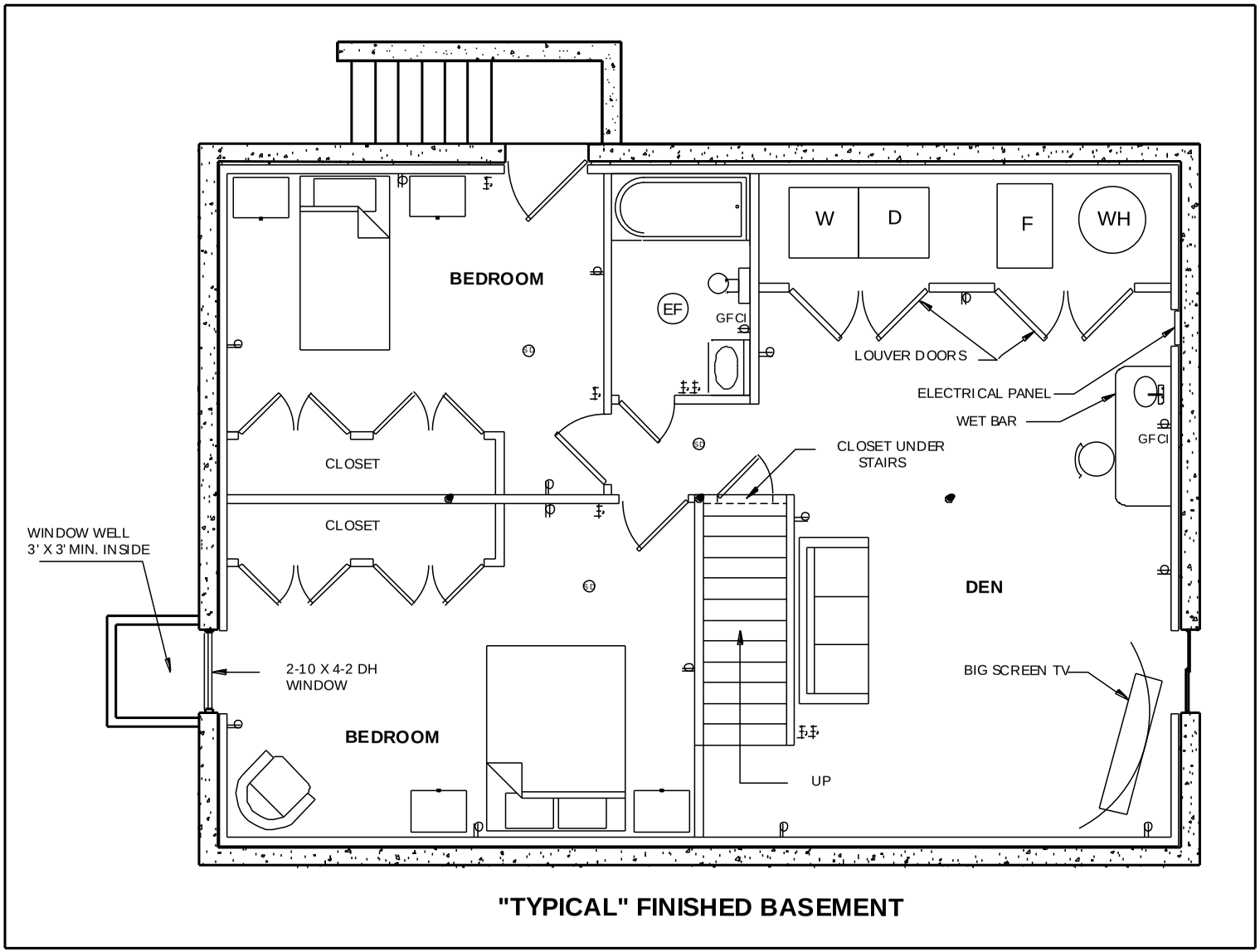


HOLES IN JOISTS

NOTCHES & HOLES IN JOISTS



"TYPICAL" FINISHED BASEMENT

Emergency Escape and Rescue Openings

The 1989-1993 annual average for fire deaths due to fires in homes was close to 4000 people; in addition the annual average for injuries due to fires in homes during this same time period, was 21,000. It is because of these figures for deaths and injuries, that the building codes require a means for emergency escape or rescue from specific parts of the house. Very few people have the necessary training and equipment to fight a fire in a house; when there is a fire emergency, evacuation of the occupants is the primary strategy to prevent injury or death.

Because a person who is asleep is usually unaware of when a fire begins, an emergency means of escape from a bedroom is required. A fire which begins outside the bedroom often blocks the normal egress path, and leaves the occupants with no alternative but a window or door which opens directly to the outside of the house. Although a person who is occupying a habitable space in a basement may not be asleep, an emergency escape route from the basement is required because a fire in the upper level can render that space unusable as a path of escape from the house.

The importance of early fire warning (smoke detectors) and an emergency escape path, provides the best defense against injury or death due to a fire emergency in a house. For people who because of age or physical condition, are unable to exit during a fire emergency, the emergency escape and rescue opening(s) will provide access for trained fire fighters to enter the house and get people out.

Building Code Requirement: Every sleeping room, and every basement with a *habitable space,* shall have at least one approved emergency escape and rescue opening.

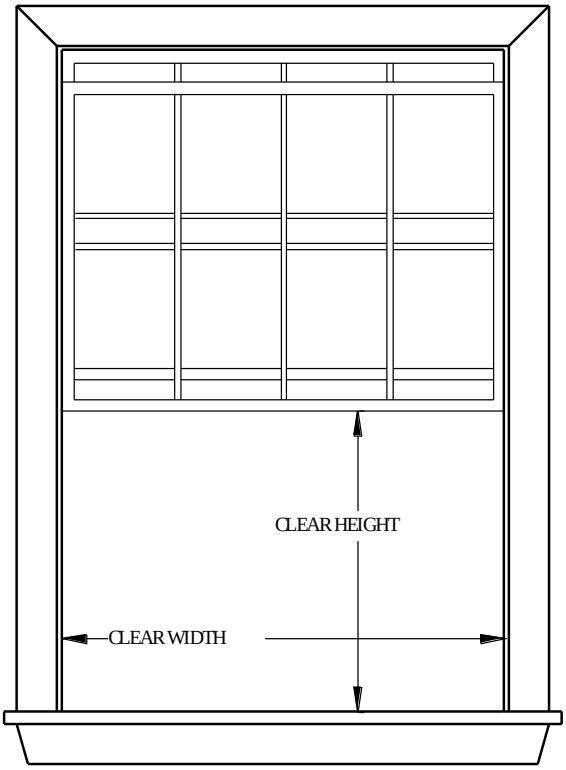
This provision of the building code applies to all new construction such as new houses, new additions to houses, newly created habitable spaces in a previously unfinished basement, a storage area converted to a sleeping room, and similar construction.

Emergency escape and rescue openings in existing houses shall be maintained to the requirements of the building code which was in effect when the house was built. No alterations to a house are required, provided the house is maintained to the building code requirements when the house was built.

Houses which were built before the Uniform Statewide Building Code (USBC) was first adopted (September 1, 1973), shall be maintained to the construction requirements at the time they were built. No alterations to a house are required, provided the house is maintained to the construction requirements when the house was built, ***unless an unsafe or unfit condition exists.***

A *habitable space* is a space in a house for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

An emergency escape or rescue opening can be a door which opens directly to the outside of the house, or an approved window which opens to the outside of the house.



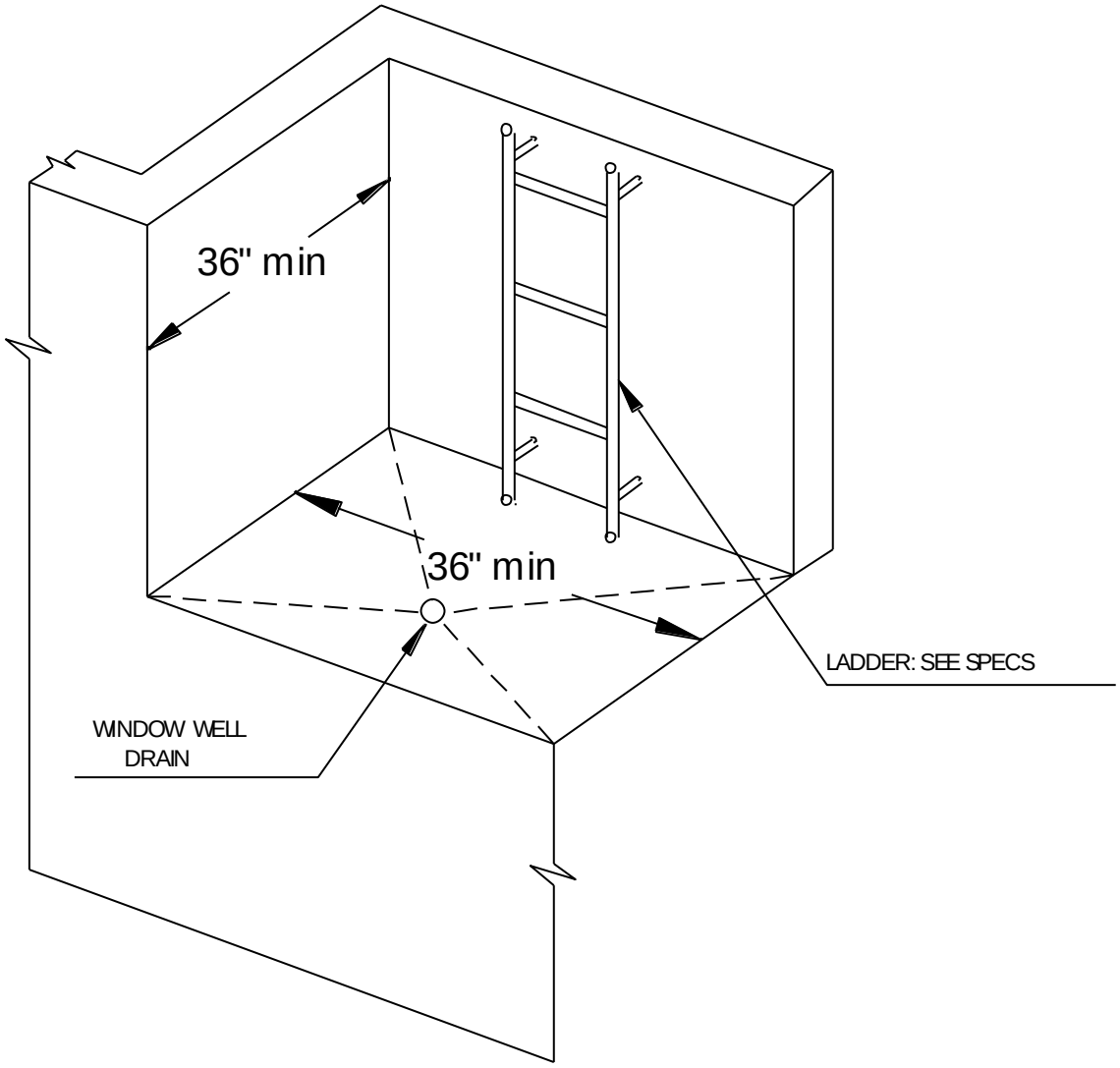
Requirements for an Emergency Escape Window

An emergency escape window (or door which opens directly to the outside of the house) is required in every bedroom, or habitable basement. In the event of a fire, this window (or door) will allow people to escape, and/or allow firefighters to get into the house to rescue people.

1. The minimum clear opening height shall be 24".
2. The minimum clear opening width shall be 20".
3. **The minimum clear opening <u>area</u> shall be 5.7 ft^2.** Multiply the clear width **x** the clear height to calculate the clear opening area. Note: An opening of 24" x 20" will have an area of 3.33 ft^2, which is not large enough.
4. **A grade level window may have a clear opening <u>area</u> of 5.0 ft^2**. A grade level window is one where the height of the window sill is no more than 44" above or below the ground.
5. The clear opening is measured with the lower sash in the raised position. If the window sashes tilt out and can be removed without the use of tools, the clear opening may be measured with the sashes removed, and the area calculated from these measurements.

6. The window sill may be a maximum of 44" above the floor.
7. Other types of windows such as sliding or casement, may also be used. With the operable part(s) of the window in the fully open position (or removed), the clear width, height and area can be determined.
8. An emergency escape window with a finished sill height below the adjacent ground elevation, shall be provided with a window well. See the next page for minimum requirements for this window well.

Window Wells



R310.2 Window wells. Window wells required for emergency escape and rescue shall have horizontal dimensions that allow the door or window of the emergency escape and rescue opening to be fully opened. The horizontal dimensions of the window well shall provide a **minimum net clear area of 9 square feet** with a minimum horizontal projection and width of 36 inches.

Exception: The ladder or steps required by Section R310.2.1 shall be permitted to encroach a maximum of 6 inches into the required dimensions of the window well.

R310.2.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches below the adjacent ground level shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Sections R314 and R315. Ladders or rungs shall have an inside width of at least 12 inches, shall project a minimum of 3" and a maximum of 6" from the wall, and rungs shall be spaced not more than 18 inches on center vertically for the full height of the window well.

IRC/2006 SECTION R313
SMOKE ALARMS

R313.2 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside of each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional story of the dwelling, including basements and cellars but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

When more than one smoke alarm is required to be installed within and individual dwelling unit the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual unit.

All smoke alarms shall be listed in accordance with UL 217 and installed in accordance with the provisions of IRC/2006 and the household fire warning provisions of NFPA 72.

R313.3 Power source. In new construction, the required smoke alarms shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke alarms shall be permitted to be battery operated when installed in buildings without commercial power or in buildings that undergo alterations, repairs or additions regulated by Section R313.2.1.